

Assessment Schedule – 2008**Statistics and Modelling: Solve straightforward problems involving probability (90643)****Evidence Statement**

Question	Evidence	Code	Judgement
One (a)	$P(\text{Farm show only})$ $= \frac{30}{200}$ (or $\frac{3}{20}$ or 0.15)	A	CAO Or equivalent.
(b)	No, the events are not mutually exclusive because: EITHER $P(S \cap W)$ $= \frac{55}{200}$ (or 0.275) $\neq 0$ OR 55 people participated in both activities OR The total is more than 200, so some people must have participated in both activities.	A	Need BOTH the answer “No” AND a valid reason with some form of numerical justification (accept if comment is numerically demonstrated in part (a)).
Two	$P(\text{two are alpaca jerseys})$ $= \frac{4}{10} \times \frac{3}{9} \times \frac{6}{8} + \frac{4}{10} \times \frac{6}{9} \times \frac{3}{8} + \frac{6}{10} \times \frac{4}{9} \times \frac{3}{8}$ $= \frac{216}{720} (= \frac{3}{10} = 0.3)$ OR $P(\text{two are alpaca jerseys})$ $= \frac{{}^4C_2 \times {}^6C_1}{{}^{10}C_3}$ $= 0.3$	A	CAO
Three	$P(\text{exactly one sale was made on-line to a non-New Zealander})$ $= \frac{22}{85} \times \frac{63}{84} + \frac{63}{85} \times \frac{22}{84}$ $= \frac{1386}{3570}$ $= \frac{33}{85} (= 0.3882)$	MA	CAO Or equivalent.
Four	$P(\text{jersey} \cap \text{other})$ $= 0.15 \times 0.84$ $= 0.126$	MA	CAO

Question	Evidence	Code	Judgement
Five (a)	$P(\text{no damage to all 3 packages})$ $= (0.8 \times 0.97 + 0.2 \times 0.95)^3$ $= (0.966)^3$ $= 0.901$	A M	CAO Accept any rounding to at least 2 sig. fig.
(b)	$P(\text{Fast Movers/no damage})$ $= \frac{(0.2 \times 0.95)^3}{0.901}$ $= 0.00761$	E M	CAO Allow consequential error from Five (a).
Six	$\frac{{}^m C_2 \times {}^n C_1}{{}^{m+n} C_3} = 2 \times \frac{{}^m C_1 \times {}^n C_2}{{}^{m+n} C_3}$ ${}^m C_2 \times {}^n C_1 = 2 \times {}^m C_1 \times {}^n C_2$ $\frac{m(m-1)}{2!} \times n = 2 \times m \times \frac{n(n-1)}{2!}$ $mn(m-1) = 2mn(n-1)$ $m-1 = 2n-2$ $\therefore m = 2n-1$ <p>OR</p> <p>Using a tree diagram:</p> $\begin{aligned} & \frac{m}{n+m} \times \frac{m-1}{n+m-1} \times \frac{n}{n+m-2} \\ & + \frac{m}{n+m} \times \frac{n}{n+m-1} \times \frac{m-1}{n+m-2} \\ & + \frac{n}{n+m} \times \frac{m}{n+m-1} \times \frac{m-1}{n+m-2} \\ & = 2 \times \left(\frac{m}{n+m} \times \frac{n}{n+m-1} \times \frac{n-1}{n+m-2} \right. \\ & \quad \left. + \frac{n}{n+m} \times \frac{m}{n+m-1} \times \frac{n-1}{n+m-2} \right. \\ & \quad \left. + \frac{n}{n+m} \times \frac{n-1}{n+m-1} \times \frac{m}{n+m-2} \right) \\ & \Rightarrow 3nm(m-1) = 6nm(n-1) \\ & \Rightarrow 3m-3 = 6n-6 \\ & \Rightarrow m = 2n-1 \end{aligned}$	E M	Must clearly prove $m = 2n - 1$.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Solve straightforward problems involving probability.	Solve probability problems.	Apply probability theory.
2 A	3 M OR 2 M + 2 A	1 E + 3 M OR 1 E + 2 M + 2 A

The following Mathematics-specific marking conventions may also have been used in marking this paper:

- errors are circled
- a caret (^) indicates an omission
- **NS** indicates there is not sufficient evidence to award a grade
- **CON** indicates “consistency” where an answer is obtained using a prior – but incorrect – answer, and **NC** indicates the answer is not consistent with wrong working
- **CAO** indicates the “correct answer only” is given but that the Assessment Schedule indicates that more evidence is required
- **#** indicates that a correct answer is obtained but then further (unnecessary) working results in an incorrect final answer
- **RAWW** indicates “right answer, wrong working”
- **R** indicates “rounding error” and **PR** is “premature rounding”, either of which results in a significant round-off error in the answer (if the question requires evidence for rounding)
- **U** indicates incorrect or omitted units (if the question requires evidence for units)
- **MEI** indicates where a minor error has been made and ignored.